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(58) Field of search
UK CL (Edition J) B3T
INT CL[4] B23B

(54) Lathe with powered cutter

(57) The lathe (10) for machining a workpiece e.g. wood comprises a leadstock and tailstock for mounting a workpiece for angular movement about an axis (A), a powered cutting tool (25) e.g. a demountable drill or router disposed alongside the workpiece, for producing a cut in the workpiece, the cutting tool (25) being movable bodily longitudinally of said axis (A), and manual drive means (30) for effecting relative movement between the workpiece and the cutting tool body (25). The workpiece station is manually controlled by the same means as the tool movement for synchronisation. Tool position laterally of the work is variable during the longitudinal movement by a template selectively fixed in holes (51). The workpiece station or tool movement transmission can be disconnected selectively from the manual control.

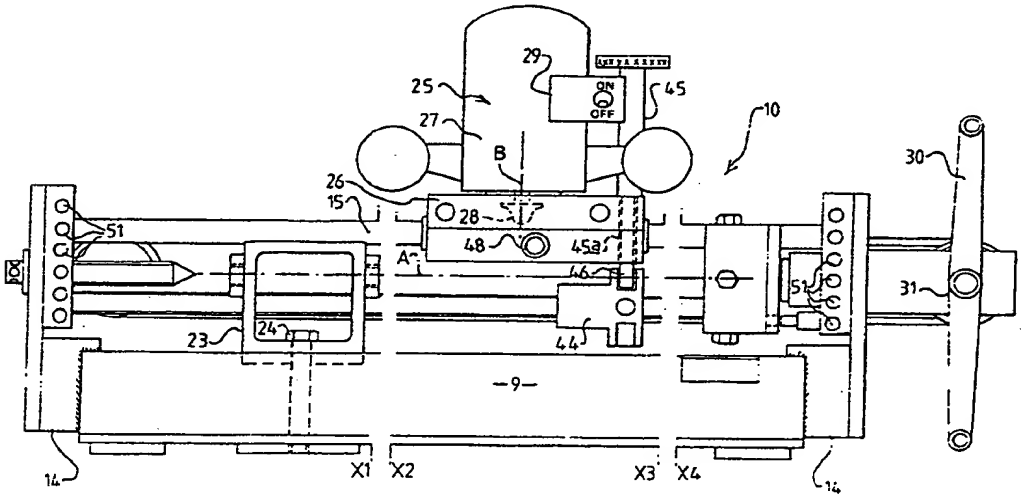

FIG 1

At least one drawing originally filed was informal and the print reproduced here is taken from a later filed formal copy.

The claims were filed later than the filing date within the period prescribed by Rule 25(1) of the Patents Rules 1982.

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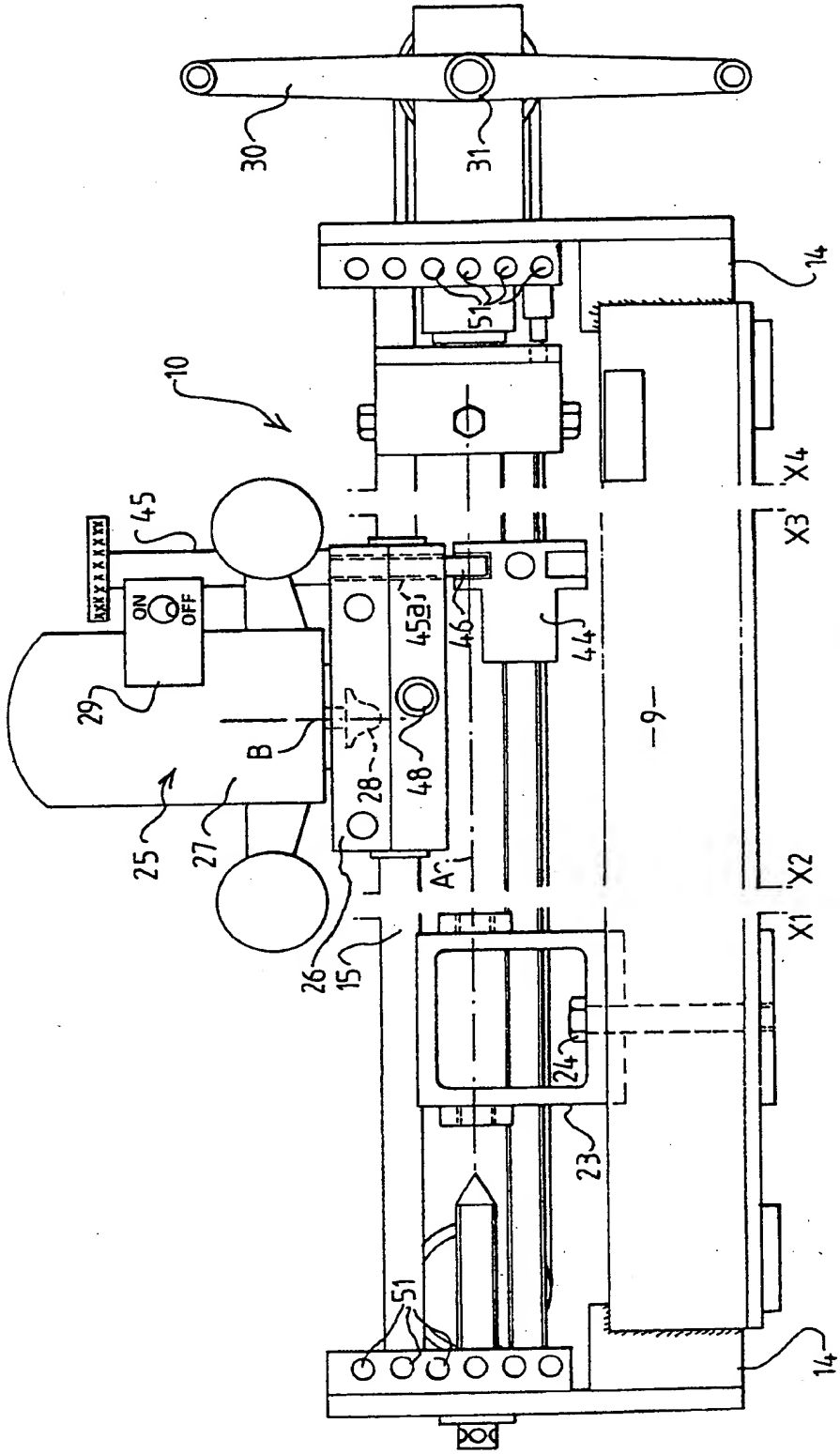
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FIG 1

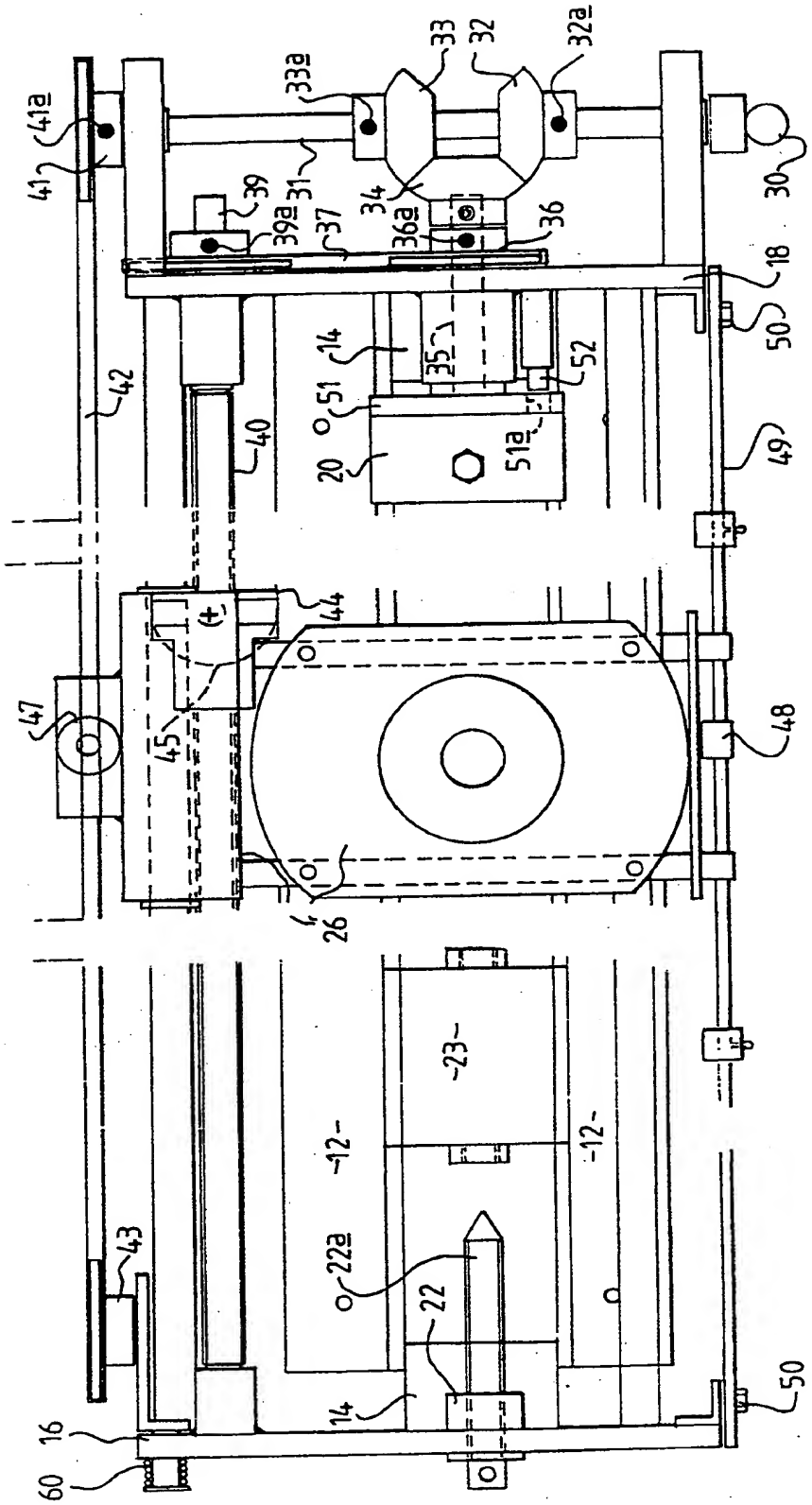
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FIG 2

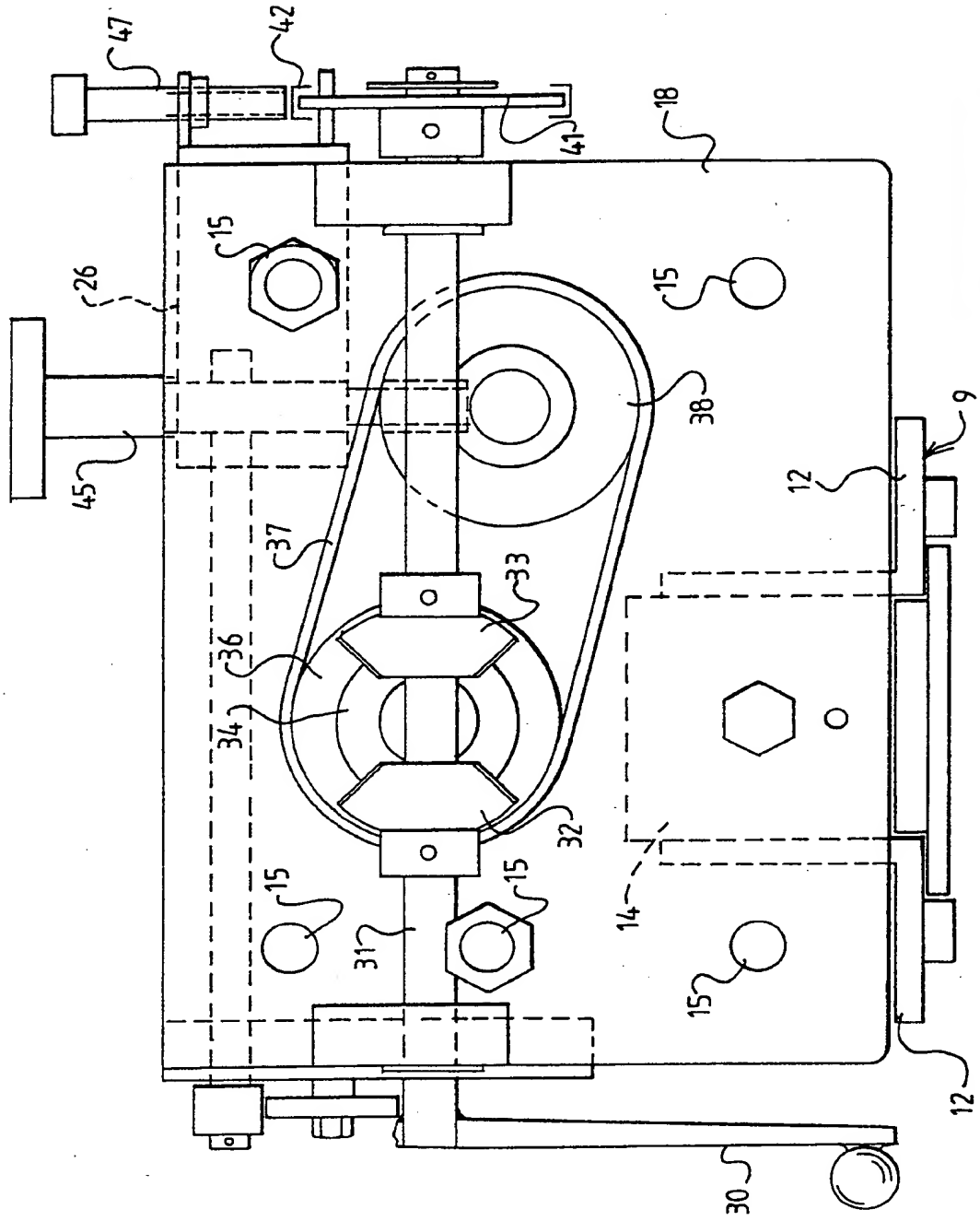

FIG 3

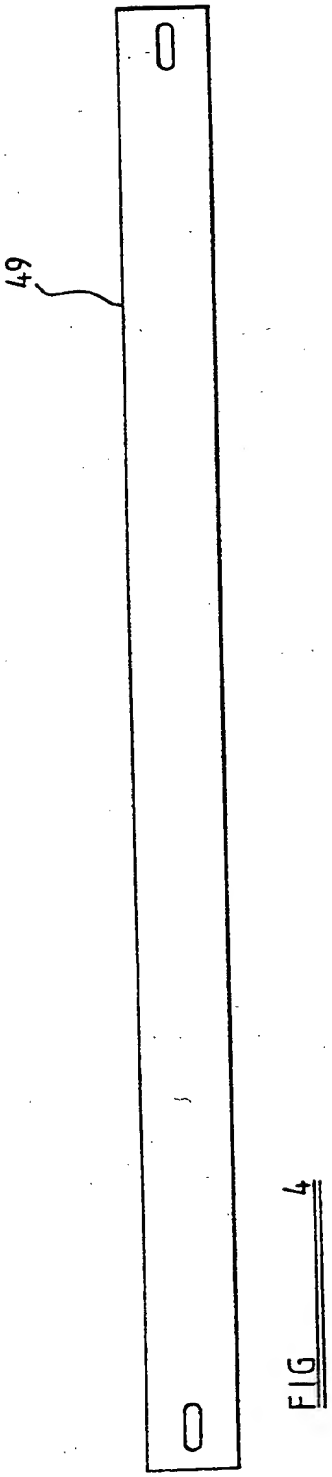

FIG 4

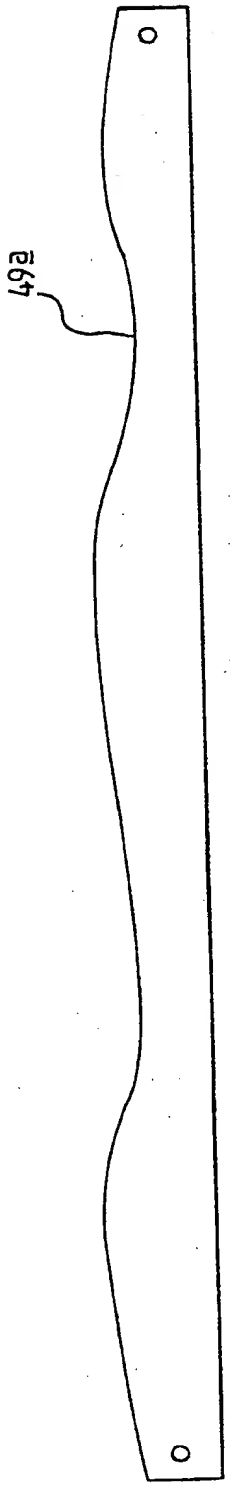

FIG 5

PATENTS ACT 1977

WL/PL/LF/A5767GB

Title: Apparatus for machining a workpiece

Description of Invention

This invention relates to apparatus for machining a workpiece.

According to the invention, there is provided apparatus for machining a workpiece, comprising means for mounting a workpiece for angular movement about an axis, a powered cutting tool disposed alongside a region of the apparatus which in use accommodates the workpiece, for producing a cut in the workpiece, the cutting tool being movable bodily at least in a direction longitudinally or generally longitudinally of said axis, and manual drive means for effecting relative movement between the workpiece and a body of the cutting tool.

The cutting tool may be permanently mounted, or alternatively may be demountably mounted.

Preferably the manual input for the manual drive means is generally remote from the cutting tool.

In a preferred form of the invention the workpiece is manually rotatable about said axis under action of the manual drive means, and for example the apparatus may comprise means for synchronising said bodily movement with said rotation of the workpiece, preferably such that, for a predetermined width of said cut, for each rotation of the workpiece the cutting tool moves bodily in said direction through a distance no more than the width of cut of the cutting device.

Thus, for example, said bodily movement of the cutting tool may occur due to rotation of a helically threaded lead screw whose pitch is no more than said width.

Preferably all relative movement between the workpiece and the body of the cutting tool, when actual machining is occurring, is effected under, or in consequence of, action of the manual drive means.

The cutting tool may comprise a body in or on which is mounted, for

high speed rotation relative to the body, a bit or the like.

The bit may for example be a drill bit or a "router" bit, and the cutting tool may for example be an electrically powered hand tool of drill or router type, mounted demountably on the apparatus.

Preferably the cutting tool is arranged such that the bit is rotatable about an axis generally transverse to the axis of rotation of the workpiece.

The apparatus may be provided with a template mounted on a frame of the apparatus and a template follower associated with the cutting tool, arranged such that the distance of the cutting tool from said axis of rotation of the workpiece varies with the longitudinal position of the cutting tool, whereby a profile corresponding generally to that of the template may be reproduced on the workpiece, and preferably there is a reduction in scale from the contour changes of the template to the corresponding contour changes produced on the workpiece.

Preferably said manual drive means constitutes a common manual drive means for effecting relative movement between the workpiece and a body of the cutting tool in each of a plurality of modes of operation of the apparatus.

Preferably the drive from said common manual drive means is transmitted through a plurality of tranmission elements mounted on respective shafts, one or more such element being arranged in adjustable manner, whereby it either transmits drive to or from said shaft, or does not transmit drive to or from said shaft, according to its state of adjustment.

Thus, a desired mode of operation of the apparatus may be achieved by suitably adjusting said element or elements so as to transmit said drive to those parts of the apparatus which, in that mode, are required to be driven.

Thus the drive may be transmitted in such a way as to cause, simultaneously, rotation of the workpiece about said axis, and bodily movement of the cutting tool in said direction, and/or in another mode of operation, the drive may be transmitted so as to cause only said bodily movement of the cutting tool.

One embodiment of the invention will now be described, by way of example only, with reference to the accompanying drawings, in which:

FIGURE 1 is a front elevational view of apparatus in accordance with the invention, with portions between the lines X1 and X2 and between the lines X3 and X4 omitted for ease of illustration, and with a template part of the apparatus omitted for clarity;

FIGUPES 2 is a plan view from above of the apparatus of FIGURE 1, including a template but with a cutting tool of the apparatus omitted for clarity:

FIGURE 3 is an end elevational view of the apparatus the cutting tool again being omitted and one half of a handle of the apparatus being omitted for clarity; and

FIGURES 4 and 5 show two alternative templates suitable for use in the apparatus.

Referring to the drawings, apparatus 10 illustrated is expressly in accordance with the present invention, and is intended for use in machining a workpiece (not shown).

The apparatus 10 comprises a main "bed" assembly 9 afforded by two parallel pieces of angle iron 12, metal blocks 14 being welded between adjacent end portions of the angle iron pieces and main end plates 16 and 18 being bolted to those blocks. A plurality of metal rods 15 extend between the end plates 16, 18.

The apparatus 10 comprises a rotatable headstock 20 and a main tailstock 22 between which a workpiece, for example a wooden workpiece, may be mounted for angular movement about an axis A. For relatively short workpieces an adjustable tailstock 23 is provided, which is longitudinally movable along the pieces 12, to a position suited to the length of the particular workpiece concerned. in which position it may be secured by tightening bolt 24. A tapered pin 22a of the main tailstock is removable therefrom, and is re-mounted in the adjustable tailstock 23 when use of the latter is required.

An electrically powered cutting tool 25 is mounted, in this example demountably mounted, on a carrier member 26 disposed adjacent to (in this example, above) that region of the apparatus 10, between the headstock and one or other tailstock, which in use accommodates the workpiece. The cutting tool has a body or casing 27 and a cutting bit 28 mounted on the body for high speed electrically driven rotation, relative to the body 27, about an axis B generally transverse, and in this example generally orthogonal to, the axis A. An "on/off" electrical switch 29 is provided for switching the tool 25 on and off.

In this example, the tool 25 is an electrically powered hand tool of "router type" the bit 28 being a router bit, but alternatively an electrically

powered hand tool of drill type, provided with a drill or router bit, could be used.

In either case, the effect of the bit, when rotating at high speed, is to produce a cut in the workpiece when it comes into operative contact with the workpiece, the width of the cut being determined essentially by the diameter of the bit.

The cutting tool 25, through the intermediary of the carrier 26, is mounted on an upper rear one of the rods 15, which rod is of circular cross-section, such that the tool is movable bodily, along and guided by said rod, in a direction longitudinally of the apparatus, parallel to the axis A, the carrier 26 also being capable of angular movement (resulting in bodily upward and downward movement of the tool 25) about an axis (parallel to the axis A) defined by said rod.

In the apparatus 10, relative movement, and in this example all relative movement, between the workpiece and the carrier 26/cutting tool body 27, when machining is occurring, is effected under, or in consequence of, action of manual drive means of the apparatus 10.

Said manual drive means comprises a manually graspable handle 30, by manual rotation of which manual input to the manual drive means is effected.

The handle 30 drives rotation of a shaft 31 on which a pair of transmission elements in the form of bevel gears 32 and 33 (teeth not shown) are adjustably mounted. The bevel gears 32 and 33 are in permanent mesh with another transmission element, bevel gear 34, rigidly mounted on a rotatable shaft 35 on which the headstock 20 is similarly rigidly mounted.

Also adjustably mounted on the shaft 35 is a further transmission element, namely a sprocket wheel 36 which, through a chain 37 is capable of driving rotation of another sprocket wheel 38 itself adjustably mounted on a further rotatable shaft 39. The shaft 39 is operative to drive rotation of a helically threaded lead screw 40 which extends longitudinally of the apparatus 10, parallel to the axis A.

The shaft 31 also carries, mounted in adjustable manner, a still further transmission element in the form of a further sprocket wheel 41 which is drivingly connected, through a chain (or belt) 42, to a further sprocket wheel 43 rotatably mounted essentially at or near the far end of the apparatus 10.

The lead screw carries a complimentarily helically threaded member 44

which, in consequence of rotation of the lead screw, moves longitudinally of the apparatus in controlled manner. The tool carrier 26 carries a rotatably adjustable member 45 having a shank portion 45a in helically threaded engagement with the carrier 26, so as to be movable upwards and downwards relative to the carrier 26 when rotated by a user, between a raised position wherein a lower end portion 46 of the member 45 does not engage the member 44 (so that lead screw rotation does not cause movement of the carrier 26) and a lowered position wherein said portion 46 enters an aperture in member 44 such that longitudinal movement of member 44 due to lead screw rotation is transmitted to the carrier 26, so that both the carrier 26 and tool 25 are thereby caused to move longitudinally of the apparatus.

A threaded member 47, somewhat analogous to the member 45. is provided at the rear of the carrier 26 and, according to its adjusted position, either does or does not clamp the carrier 26 to the chain 42.

At the forward end of the carrier 26 there is mounted a small follower/roller 48. freely rotatable about a generally horizontal axis extending in a front-rear direction, which roller 48 throughout use rests upon, and moves along, a guide or template 49 which is removably mounted, by a pair of bolts 50. so as to span the front of the apparatus, so as to control the cutting height of the tool 25 and hence the depth of cut of the tool 25 into a workpiece. The template 49 may be mounted at any of a plurality of heights, by selecting appropriate threaded holes 51 for the bolts 50.

The adjustable mounting of the gears 32, 33 and wheels 36, 39, 41 is by way of respective quick release locking pin devices 32a, 33a, 36a. 39a, 41a respectively, according to the setting of which the respective gear or wheel does or does not transmit drive to or from its respective shaft.

The apparatus 10 is a mulit-mode apparatus and in general each mode may require no more than four locking pins to be operative, so that only that number of such pins need be provided.

The aforesaid manual drive means constitutes a common manual drive means for effecting relative movement between the workpiece and tool body in each of the plurality of modes of operation of the apparatus.

In a first mode of operation, the locking pins 32a. 36a and 39a are operative (to cause drive to be transmitted) whereas the pin 33a and the pin 41a (or member 47) are inoperative. Thus, in this mode, drive from the handle 30 is transmitted to the shaft 35, to effect manually driven rotation of

the workpiece through the intermediary of the headstock 20, and also, through chain 37 and wheel 39, to the lead screw 40 so as to cause longitudinal movement of member 44, the member 45 being in its lowered position, engaged with member 44, so that corresponding manually driven longitudinal movement of the tool 25 is also effected. Through the arrangement of the wheels 36 and 39 and chain 37, said longitudinal movement is synchronised with said workpiece rotation, and the relationship between the bit 28 and the lead screw is such that for each rotation of the workpiece, the longitudinal distance moved by the tool (i.e. the pitch of the screw) is no more than the width of cut of the bit.

In this manner, in this mode, with the tool 25 swtiched on so as to rotate the bit at high speed, a smooth basic finish is achieved on the workpiece, along its length, in a precisely controlled manner.

Using the straight template 49 to guide the roller 48, a cylindrical straight or conically tapered profile may be produced on the workpiece in this mode, according to whether the template 49 is set horizontally or inclined to the horizontal.

More complicated curvilinear workpiece profiles may be provided by substituting for example the template 49a (Figure 5), such as to produce a wooden furniture leg or the like. At any given point the machined workpiece so produced is of circular cross-section, but of varying diameter along its length. In this example, since the template is mounted further from the upper rear rod 15 than the tool 25, there is a reduction in scale from the template to the workpiece, thereby producing a high quality finish.

In a second mode of operation of the apparatus 10, the workpiece is positioned in one of a plurality of equally spaced angular positions, predefined by respective apertures 51a in an indexing turret 51, and is releasably held there by a user-operable spring loaded pin 52 which, when operative, enters one of the apertures to hold the workpiece in the corresponding position. The member 45 is moved to its raised position and the pins 32a and 33a are released; the pin 41a is made operative. The member 47 is made operative to clamp against the chain 42. Thus, having first switched on the tool 25, rotation of the handle 30 is effective simply to traverse the tool 25 longitudinally along the workpiece, due to movement of the chain 42, to produce a straight longitudinal groove or flat or flute or the like on the workpiece. This may be repeated with the workpiece in alterantive indexed

angular positions.

In a third mode of operation, the member 45 is again raised, and the member 47 again clamps the carrier 26 to the chain 42, but the pins 36a, 41a and 32a are made operative. The pin 33a is made inoperative. With the tool 25 switched on, the effect of turning the handle 30 is then to rotate the workpiece about the axis A while simultaneously moving the tool longitudinally (much faster than would be the case with lead screw 40) via the chain 42, to produce a spiral groove or scroll in the workpiece. Different positions for the commencement of a plurality of such spiral grooves may be selected using the indexing means. If the pin 33a is made operative instead of pin 32a, a spiral groove of opposite sense will be produced.

A spring loaded, pivotting yoke assembly 60, on which wheel 43 is mounted, keeps chain (or belt) 42 tensioned.

The apparatus in accordance with the invention offers considerable safety advantages compared with conventional appliances such as wood turning lathes (in the latter, rotation of the workpiece is power driven at very high speed. with obvious danger to a user.) Through using a compact power tool and arranging for relatively low speed manual rotation of the workpiece, past the tool, the apparatus 10 is considerably safer to use than the aforesaid conventional appliances, and as such is particularly suited to use in a domestic do-it-yourself environment or in small workshops (e.g. school workshops) where the dangers associated with the conventional appliances often prevent general use of said conventional appliances. Furthermore, the apparatus 10 in accordance with the invention is relatively inexpensive. A particular advantage of the apparatus 10 is that the manual input handle 30 is, at least for substantial periods, located relatively remote from the point where the actual machining operating is occurring, with obvious safety benefits.

The features disclosed in the foregoing description, or the accompanying drawings, expressed in their specific forms or in terms of a means for performing the disclosed function, or a method or process for attaining the disclosed result, or a class or group of substances or compositions, as appropriate, may, separately or in any combination of such features, be utilised for realising the invention in diverse forms thereof.

CLAIMS

1. Apparatus for machining a workpiece, comprising means for mounting a workpiece for angular movement about an axis, a powered cutting tool disposed alongside a region of the apparatus which in use accommodates the workpiece, for producing a cut in the workpiece, the cutting tool being movable bodily at least in a direction longitudinally or generally longitudinally of said axis, and manual drive means for effecting relative movement between the workpiece and a body of the cutting tool.

2. Apparatus according to Claim 1 wherein the cutting tool is permanently mounted.

3. Apparatus according to Claim 1 wherein the cutting tool is demountably mounted.

4. Apparatus according to any one of the preceding Claims wherein the manual input for the manual drive means is generally remote from the cutting tool.

5. Apparatus according to any one of the preceding Claims wherein the workpiece is manually rotatable about said axis under action of the manual drive means.

6. Apparatus according to Claim 5 wherein the apparatus comprises means for synchronising said bodily movement with said rotation of the workpiece.

7. Apparatus according to Claim 6 such that, for a predetermined width of said cut, for each rotation of the workpiece the cutting tool moves bodily in said direction through a distance no more than the width of cut of the cutting device.

8. Apparatus according to Claim 7 wherein said bodily movement of the cutting tool occurs due to rotation of a helically threaded lead screw whose pitch is no more than said width.

9. Apparatus according to any one of the preceding Claims wherein all relative movement between the workpiece and the body of the cutting tool, when actual machining is occurring, is effected under, or in consequence of, action of the manual drive means.

10. Apparatus according to anyone of the preceding Claims wherein the cutting tool comprises a body in or on which is mounted, for high speed rotation relative to the body, a bit or the like.

11. Apparatus according to Claim 10 wherein the bit is a drill bit or a "router" bit.

12. Apparatus according to Claim 10 or Claim 11 where directly or indirectly dependent upon Claim 3 wherein the cutting tool is an electrically powered hand tool of drill or router type, mounted demountably on the apparatus.

13. Apparatus according to any one of Claims 10 to 12 wherein the cutting tool is arranged such that the bit is rotatable about an axis generally transverse to the axis of rotation of the workpiece.

14. Apparatus according to any one of the preceding Claims wherein the apparatus is provided with a template mounted on a frame of the apparatus and a template follower associated with the cutting tool, arranged such that the distance of the cutting tool from said axis of rotation of the workpiece varies with the longitudinal position of the cutting tool, whereby a profile corresponding generally to that of the template may be reproduced on the workpiece.

15. Apparatus according to Claim 14 wherein there is a reduction in scale from the contour changes of the template to the corresponding contour changes produced on the workpiece.

16. Apparatus according to any one of the preceding Claims wherein said manual drive means constitutes a common manual drive means for effecting relative movement between the workpiece and a body of the cutting tool in each of a plurality of modes of operation of the apparatus.

17. Apparatus according to Claim 16 wherein the drive from said common manual drive means is transmitted through a plurality of transmission elements mounted on respective shafts, one or more such element being arranged in adjustable manner, whereby it either transmits drive to or from said shaft, or does not transmit drive to or from said shaft, according to its state of adjustment.

18. Apparatus according to Claim 17 wherein by suitably adjusting said element or elements, the drive may be transmitted in such a way as to cause, simultaneously, rotation of the workpiece about said axis, and bodily movement of the cutting tool in said direction.

19. Apparatus according to Claim 17 or Claim 18 wherein by suitably adjusting said element or elements, the drive may be transmitted so as to cause only said bodily movement of the cutting tool.

20. Apparatus for machining a workpiece substantially as hereinbefore described with reference to and/or as illustrated in the accompanying drawings.

21. Any novel feature of novel combination of features described herein and/or illustrated in the accompanying drawings.

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